Scientific Computing Assignment 1

120095L

P.M.T de Silva

Q1)

1. In pi-mystery is taken where x is between ‘0’ and ‘1’. In the code “**step**” variable denotes the increment of x. In the code step =. Reason why we get the value of π is where step is is almost equal to

So by multiplying the sum by 4 we can get π.

1. Sd

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| # Trials | SP/ DP |  | CPU sequential (curand) | CPU Parallel [curand] (T=# threads) | | | GPU | | | |
| T=2 | T=4 | T=8 | Mystery | Myrand | Curand | Curand-Thrust |
| 224 | SP | PI estimate | 3.141442 | 3.141810 | 3.141482 | 3.141745 | 3.141587 | 3.144249 | 3.167809 | 3.141096 |
| Error | -1.51x10-4 | 2.17x10-4 | 1.10x10-4 | 1.53x10-4 | -5x10-6 | 2.66x10-3 | 0.026217 | 4.97x10-4 |
| Time (s) | 1.063518 | 19.421617 | 11.804507 | 79.620592 | 0.917957 | 0.003 | 0.010263 | 0.023418 |
| DP | PI estimate | 3.141442 | 3.14181 | 3.141433 | 3.141897 | 3.141593 | 3.144249 | 3.141095 | 3.141096 |
| Error | -1.51x10-4 | 1.88x10-4 | 1.60x10-4 | 3.04x10-4 | 1x10-10 | 2.66x10-3 | -4.97x10-4 | 4.97x10-4 |
| Time (s) | 1.171738 | 7.200289 | 12.725884 | 82.519276 | 0.867725 | 0.004756 | 0.012645 | 0.028759 |
| 226 | SP | PI estimate | 3.141401 | 3.141883 | 3.141809 | 3.141851 | 3.141562 | 3.139517 | 3.141708 | 3.141204 |
| Error | -1.92x10-4 | 2.90x10-4 | 2.17x10-4 | 2.59x10-4 | -3x10-5 | 2.08x10-3 | 1.15x10-4 | 3.89x10-4 |
| Time (s) | 4.061497 | 46.822362 | 44.885280 | 319.641074 | 0.914319 | 0.013159 | 0.037511 | 0.023403 |
| DP | PI estimate | 3.141401 | 3.141851 | 3.141678 | 3.141979 | 3.141593 | 3.139507 | 3.141708 | 3.141204 |
| Error | -1.92x10-4 | 2.59x10-4 | 8.50x10-5 | 3.87x10-4 | -1x10-10 | 2.09x10-3 | 1.15x10-4 | 3.89x10-4 |
| Time (s) | 4.060502 | 26.369814 | 45.321292 | 320.943973 | 0.898029 | 0.015773 | 0.047208 | 0.028804 |
| 228 | SP | PI estimate | 3.141581 | 3.141535 | 3.141564 | 3.141592 | 3.141117 | 3.141507 | 3.141651 | 3.141428 |
| Error | -1.2x10-5 | 5.88x10-5 | 2.90x10-5 | 6.28x10-7 | -4.75x10-4 | 8.5x10-5 | 5.9x10-5 | 1.65x10-4 |
| Time (s) | 16.394271 | 136.582732 | 180.022518 | 1298.124882 | 1.284318 | 0.049643 | 0.156337 | 0.29724 |
| DP | PI estimate | 3.141651 | 3.141405 | 3.141506 | 3.141688 | 3.141593 | 3.141498 | 3.141581 | 3.141428 |
| Error | 5.9x10-5 | 1.89x10-4 | 8.67x10=5 | 9.52x10-5 | 1x10-10 | 9.5x10-5 | -1.2x10-5 | 1.65x10-4 |
| Time (s) | 16.207429 | 154.774575 | 147.161543 | 1303.529679 | 1.153865 | 0.059948 | 0.186130 | 0.039703 |

Q2)

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| --- | --- | --- | --- | --- | --- | --- |
| N | SP/ DP | CPU sequential (curand) | CPU Parallel [curand] (T=# threads) | | | GPU |
| T=2 | T=4 | T=8 |
| 108 | SP | 0.483626 | 0.539505 | 0.865274 | 1.005427 | 1.860196 |
| DP | 0.489203 | 0.567083 | 0.809312 | 1.489120 | 1.150513 |
| 5x108 | SP | 2.417210 | 2.469571 | 3.331460 | 3.630502 | 2.541325 |
| DP | 2.791330 | 2.617331 | 4.177873 | 5.560133 | 2.492102 |
| 109 | SP | 4.832057 | 5.301819 | 6.359695 | 7.690754 | 5.753221 |
| DP | 5.007307 | 5.034356 | 7.515349 | 12.859134 | 4.825234 |

Q3)

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| NxN | SP/ DP | CPU sequential (curand) | CPU Parallel [curand] (T=# threads) | | | GPU |
| T=2 | T=4 | T=8 |
| 600 | SP | 1.341795 | 1.815632 | 2.078556 | 2.440139 | 0.826492 |
| DP | 1.358165 | 1.907338 | 1.918564 | 1.989092 | 0.020327 |
| 1200 | SP | 9.662028 | 12.965625 | 14.062553 | 13.931986 | 0.877824 |
| DP | 10.490035 | 13.881356 | 13.572083 | 14.478379 | 0.090056 |
| 1800 | SP | 33.722122 | 44.199848 | 44.407766 | 46.266324 | 1.016127 |
| DP | 43.252120 | 62.031173 | 62.118678 | 65.050126 | 0.560759 |

Students who helped me to do the assignment

* K.R.V. Perera
* Jawardh Sally
* Yasiru Kassapa